MACHINE SAFETY

Safety Training Goal: Understand the basic rules for working safely with machines, be familiar with common machine guards and safety devices, recognize the major hazards of machines to hand safety and know how to protect hands from them, and understand why lockout/tagout procedures are important and the proper rules and procedures for them.

Section I. Machinery.

1. Introduction.

a. Both in the workplace and at home, machines are intended to make our jobs easier. People seldom think of the machines we use at home as having the same potential for injury that "industrial" machines. But machines are not toys (in the workplace or otherwise). Machines can cause serious injuries and even death if not used in a safe manner. Remember, anything that a machine can do to an inanimate object (punch, cut, press, drill, roll, transport, grind, etc) it can also do to you.

b. Machines don't cause accidents by themselves. Accidents involving machines happen because of human error. Someone is careless, fails to be alert, or doesn't know how to use or maintain them properly.

2. Discussion.

a. Hazards and injuries.

(1) Machines cause thousands of injuries each year, ranging from minor cuts to severe injuries like amputations. Machine injuries also can be fatal.

(2) Many machine injuries result from mechanical hazards that involve the moving parts of the machine. Workers should be especially alert to hazards at the point of operation. This is the spot where the work actually takes place (such as drilling, punching, etc.). The point of operation can cause injuries by contacting body parts, or by causing chips by causing chips or sparks to fly up and hit the operator.

(3) Mechanical hazards are not the only dangers of machines. Other hazards may include: electrical hazards, such as shock, burns, and fire; physical hazards, such as noise hazards, which can temporarily or permanently damage hearing, or chemical hazards, if chemicals are used with the machine is operated.

b. Working safely with machines.

(1) Here is some basic information for working safely with machines:

(a) Machine Guards--These are required by OSHA to protect personnel, and should never be removed or disabled while the machine is in operation.

(b) Proper Use-Don't use machines for jobs they weren't designed to do. This increases the risk of injury and can damage the machine (such as using a lawn mower to trim a hedge).

(c) Proper Maintenance-A machine that is not operating properly has an increased risk of malfunction and injury. Inspect machines regularly, report any operating problems, and don't use machines if they are not in good condition.

(2) Unfortunately, even OSHA can't require a guard for every single point of a machine that could hurt you. Even if it could, it's all too easy for people to reach around, remove, or disable a machine guard. Rules and machine guards may help, but ultimately, protecting yourself when working with machines is up to you.

(3) Know how to operate a machine safely - if you're not sure, ask for proper training.

(4) Follow proper lockout/tagout procedures to make sure the machine is de-energized before trying to repair it.

(5) Don't remove or disable a machine guard while it is operating.

(6) Don't reach around a machine guard to free a jam at the point of operation.

(7) Don't operate a machine if the guard or other safety devices have been damaged, disabled, or removed.

(8) Don't wear jewelry such as rings and bracelets, or clothing with long or loose sleeves. These can get caught in machinery and drag your hands into the hazard points.

(9) Keep long hair pulled back or under a hat to prevent entanglement.

(10) Gloves are usually thought of as protective equipment, but they usually should not be worn when working with machinery (except if they're part of a restraint device). Unless they are skintight, like surgical gloves, there is a risk that a part of the glove could get drawn into a nip point accidentally.

3. Conclusion.

As a final safety rule, remember to always remain alert when working with machines. Most injuries by machines are due to simple

carelessness - people who ignore the rules or get distracted. Stay focused on what you're doing. Take breaks if doing so helps you concentrate on your work. And of course, never operate a machine if you're under the influence of alcohol or drugs.

Section II. Machine Guards and Safety Devices.

1. Introduction.

a. Machines do lots of useful work to save us time and effort. They cut, punch, roll, drill, grind, assemble, handle, and transport-but they can't think. Only their human operators can make them do their jobs properly and safely.

b. Machines cause thousands of injuries in the workplace every year. Many are very serious, including:

(1) Crushed and broken arms and legs.

(2) Amputation of fingers and limbs.

(3) Eye injuries.

(4) Burns from hot machinery or chemicals.

(5) Electric shock.

(6) Hearing damage from excessive noise.

2. Discussion.

a. Obviously, there's a lot at stake in using machines safely. This is why OSHA requires proper machine guards and safety devices, and it's why it's important for employees to understand the company's safety rules and follow them.

(1) Machinery Hazards. There are three major types of hazards associated with moving machinery:

(a) Mechanical-These are the hazards associated with the machine's moving parts, which can injure a person's body. The critical areas of a machine are the point of operation (the spot where the work actually takes place) and the power "points" from (the place where energy is transferred through moving parts like gears, shafts, cables, and cylinders.)

(b) Electrical-These hazards include electric shock and burns from using machinery improperly or with damaged electrical equipment. A related hazard is fire, resulting from electrical problems or poor maintenance of the machinery.

(c) Noise-Excessive machinery noise can cause temporary or permanent hearing loss unless workers use proper protective

equipment.

b. Preventing Injuries. OSHA requires machinery in the workplace to have guards and safety devices to protect workers from injuring themselves.

(1) Types of machine guards include:

(a) Fixed guards-such as fences, gates, and protective covers that act as a barrier between a person and the machine's point of operation, power train, and other moving parts.

(b) Interlocking Guards-which disengages the machine's power source if opened or removed.

(c) Adjustable guards-barriers that can be adjusted manually for different kinds of operations.

(d) Self-adjusting guards-barriers that move, or self-adjust, according to the size, shape, or position of the work being performed.

(2) In addition, there are several types of safety devices to protect against injury:

(a) Sensor device-causing a machine to stop automatically when a body part enters a danger zone.

(b) Restraints and cables-attached to a worker's hands or arms, these restrict the worker's field of movement or force the worker out of the way during the dangerous part of a machine's operation.

(c) Safety trip devices-emergency controls that stop a machine if someone accidentally moves too close to a machine's moving parts.

3. Conclusion.

a. Safety guards and devices are meant to be used. A machine guard or safety device can't protect anything if it is disabled, misused, or not working properly.

b. Important safety rules are:

(1) Never remove or disable a machine guard or safety device except for maintenance where the machine is locked/tagged out.

(2) Never reach around or through a machine guard.

(3) If a machine guard or safety device is not working properly, report it to a supervisor and don't use the machine!

Section III. Keeping Hands Safe from Machinery.

1. Introduction.

a. The most important tools in the workplace aren't made of metal or wood-they're your hands. If you lost the use of your hands, you would not be able to use the other tools you need to do your job, or the activities in your daily life. So it's obviously very important to be careful when working with your hands-especially around machines.

b. This point may seem obvious, but the unfortunate fact is that thousands of workers every year experience injuries to their hands. These injuries include:

(1) Cuts and bruises.

(2) Broken bones.

(3) Deep lacerations that can do permanent damage to muscles, ligaments, and tendons.

(4) Amputation of fingers or the entire hand itself.

2. Discussion.

a. Most of these injuries come from unsafe use of machines. Remember, a machine that can cut, press, roll, or drill a piece of metal or wood can easily do the same thing to your hands if they get in the way.

b. Hazard points. All machines have two major areas to watch out for:

(1) The *point of operation,* which is the point where the work actually takes place, and

(2) The *power train,* where energy is transferred to make the machine run.

(3) Both of these areas can be particularly hazardous to your hands. The hazard points to be aware of include:

(a) "Nip points"-any place where a moving part comes close to or contacts another part, or where two moving parts come together.

(b) Blades-or other sharp parts designed to cut.

(c) Rotating parts-such as rollers, grinding wheels,

and circular blades. Because these areas are hazardous to your hands, OSHA requires machines to include safety devices that are designed to protect your hands from injury. These include:

-Machine guards-fixed, adjustable, or interlocking barriers meant to keep hands and fingers away from hazard points.

-Restraints and pull-back devices that force workers' hands away from hazard points.

-Presence-sensing devices that cause a machine to shut down when a body part comes too near.

(4) Unfortunately, even OSHA can't require a guard for every single point of a machine that could hurt you. Even if it could, it's all too easy for people to reach around, remove, or disable a machine guard. OSHA rules and machine guards may help, but ultimately, protecting your hands when working with machines is up to you.

c. Protecting your hands from hazards of machines. There are a number of "do's" and "don'ts" that apply to hand safety when working with machines:

(1) Do use push sticks, instead of your fingers, to position and move materials near the point of operation.

(2) Do make sure you know how to operate a machine safely-if you're not sure, ask for proper training.

(3) Do follow proper lockout/tagout procedures to make sure the machine is deenergized before trying to repair it.

(4) Don't remove or disable a machine guard.

(5) Don't reach around a machine guard if a machine is jammed at the point of operation.

(6) Don't operate a machine if the guards or other safety devices have been damaged, disabled, or removed-report these conditions to a supervisor.

(7) Don't wear jewelry such as rings and bracelets, or clothing with long or loose sleeves. These can get caught in machinery and drag your hands into the hazard points.

d. Gloves are usually thought of as protective equipment, but they usually should not be worn when working with machinery (except if they're part of a restraint device). Unless they are skintight, like surgical gloves, there is a risk that a part of the glove could get drawn into a nip point accidentally.

3. Conclusion.

As a final safety rule, *do* remember to always stay alert when working with machines. Most hand injuries are due to simple carelessness-people who ignore the rules in order to save time, or who get distracted. Instead, stay focused on what you're doing. Take breaks if you need to, if doing so helps you concentrate on your work. And of course, never operate a machine if you're under the influence of alcohol or drugs.

Section IV. Lockout/Tagout for Safety

1. Introduction.

a. The different types of machinery in the workplace do their work by means of energy-electrical, mechanical, hydraulic, or pneumatic, etc. Releasing this energy makes the machines run. This is very useful-but it also can be very dangerous if energy is released at the wrong time or when a human being is in the way.

b. There are many examples of people being seriously injured or killed by machinery and electrical equipment. Often, tragedies happen because people carelessly try to repair or maintain the equipment without making sure its energy source has been shut off. Many times the accident happens when another worker restarts the machine, not knowing that another worker is in the machine. To prevent this type of tragedy, OSHA developed a standard that has very specific procedures for shutting off machinery, for making sure it can't be operated after it's been shut off, and for warning employees to stay away from potential hazards. These procedures are called "Lockout/Tagout."

2. Discussion.

a. Lockout.

(1) "Lockout" means much more than simply shutting off a machine by throwing a switch. When a machine has been locked out, it means:

(a) All of the energy to the machine has been shut off.

(b) Any energy that has been stored has been released or blocked.

(c) The machine is literally locked out, and cannot be restarted or released accidentally.

(2) In lockout, a lock is placed on the part of the machine that controls the energy, such as a circuit breaker, switch, or valve. The lock itself cannot be used for any other purpose. That means, you can't use just any lock you might find in the workplace to perform a lockout-in fact, all lockout locks should be of the same general appearance so people can easily

recognize them for what they are. The lock must be strong and sturdy enough to stay in place until it's time for it to be unlocked.

(3) Most important, lockout can be performed only by employees who are trained and certified by the company to do so (often called "Authorized" employees). The name of the authorized employee should appear on the lock.

(4) "Affected" employees are those whose job required them to operate equipment or be in an area where lockout/tagout might be required. They need to understand lockout procedures and why they are important. They should know never to perform a lockout themselves or try to restart locked out equipment.

(5) Lockout involves certain specific procedures, including:

(a) Preparing for lockout and notifying other employees that lockout is about to occur.

(b) Turning off the equipment, and isolating or releasing any stored energy.

(c) Placing locks on the energy controls.

(d) Testing the controls and electrical circuits to make sure the equipment can't be energized.

b. Tagout.

(1) "Tagout" is the process of placing tags on machinery to warn workers not to start or operate the equipment. In most cases, tagout occurs after lockout and is a way of making doubly sure that other workers know to stay away from the machinery. Tagout is not a substitute for lockout. However, there are some types of machinery that cannot be locked out, for one reason or another. In these cases, tagout becomes extremely important, because it is the *only* way to warn other employees that the equipment should not be used. Tagout alone should not be used without management approval.

(2) Tagout tags also should be standardized and contain specific warnings such as "Do Not Operate." They also should include information about the danger that might occur if the equipment is operated. Like locks, tags should be sturdy and durable enough that they cannot be accidentally removed or become hard to read. Qualified employees should be the only ones to install or remove a tag.

c. Putting Equipment Back on Line. Normally, the purpose of lockout/tagout is to prevent accidental operation while machin-

ery or equipment is being maintained or repaired. But when the work is finished, that doesn't mean the danger has been eliminated. Instead, it's very important to observe proper procedures when restarting equipment that has been locked out and tagged out. The person who applied the lockout/tagout should perform the restart. These procedures include:

(a) Making sure all employees are a safe distance away from the equipment.

(b) Removing all tools from the area.

(c) Reinstalling any machine guards.

(d) Removing lockout devices and reenergizing the equipment.

(e) Notifying employees that equipment has been reenergized.

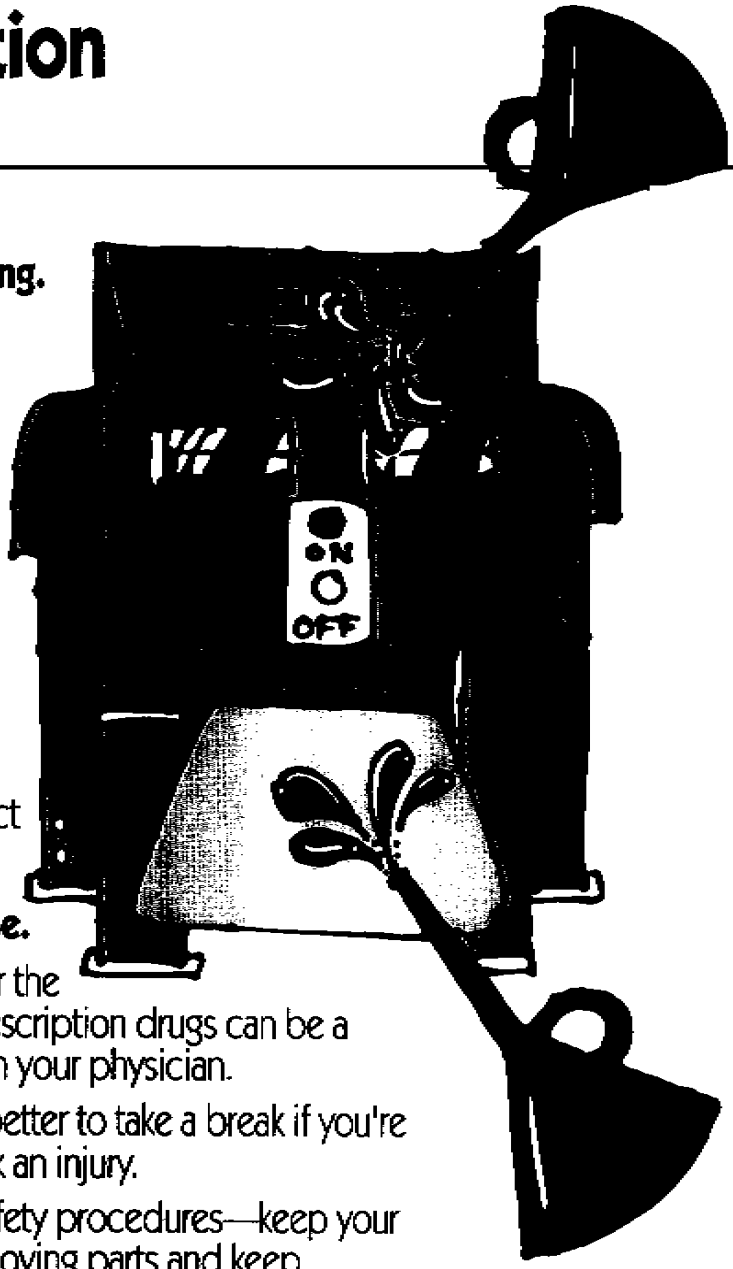
3. Conclusion.

a. Lockout/tagout requirements apply to electrical equipment as well a machinery.

b. Accidents that occur with operating machinery are usually very serious, or even fatal. That's why lockout/tagout is so important, and why these procedures should always be followed.

c. Employees should understand never to ignore locks or tags, and to notify a supervisor immediately if they notice anything improper about the way lockout/tagout procedures are being observed.

An Ounce of Prevention Protects You



Regular maintenance and safety checks prevent machine accidents from occurring.

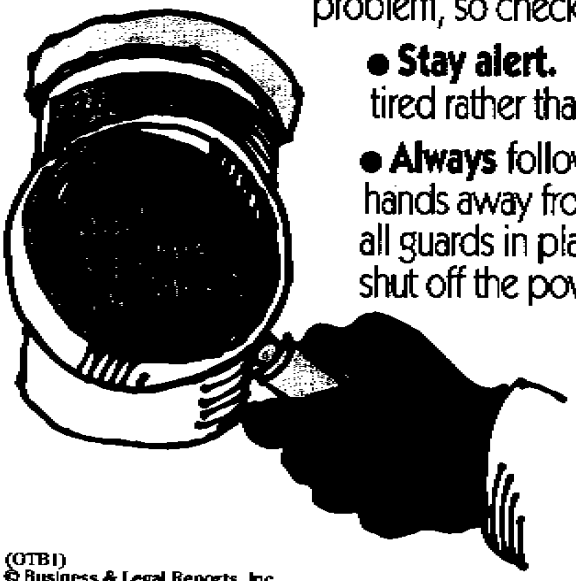
Always remember to:

Keep machines working properly.

- **Do** all maintenance you're authorized to do–keep machines oiled or greased, cutters sharp, and work areas clean. Have qualified workers do all other maintenance work.
- **Follow** all work procedures. They've been tested and approved for safe and efficient operation. If you think you know a better way to do the job, contact your supervisor.

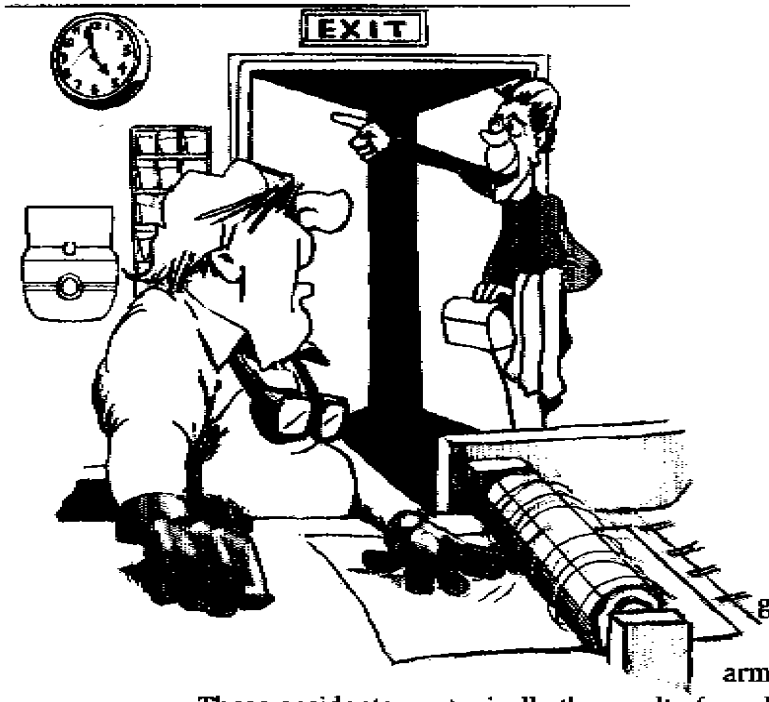
Pay attention and use common sense.

- **Don't** operate machinery when under the influence of alcohol or drugs—even prescription drugs can be a problem, so check with your physician.
- **Stay alert.** It's better to take a break if you're tired rather than risk an injury.
- **Always** follow safety procedures—keep your hands away from moving parts,and keep all guards in place. If there's a problem, shut off the power and get help.



- **Use** the right tool for the job—don't try to make a machine or tool do something it's not designed for.
- **Follow** all OSHA regulations—they're there to protect you!
- **Wear** the correct Personal Protective Equipment (PPE).

Don't Get Caught:



Avoid Moving Parts

The machinery you work with is designed for safety and has guards to protect you from accidents and injuries. But safety guards aren't foolproof. Every year, too many workers are seriously injured when a hand, arm or foot gets caught in or between machines. These accidents are typically the result of carelessness or inattention and can be prevented.

HOW IT HAPPENS

Large or small moving parts, such as rollers, presses, cutters, gears and belts, have the potential to catch and mangle fingers, hands and feet. Injuries occur when workers reach into machines or when moving parts snag clothes, jewelry or hair when power comes on unexpectedly. These incidents are more likely to occur when workers are under mental or physical stress, are trying to meet a production deadline or are improperly trained. Unsafe equipment or equipment with inadequate or missing guards is also to blame.

WHAT YOU CAN DO

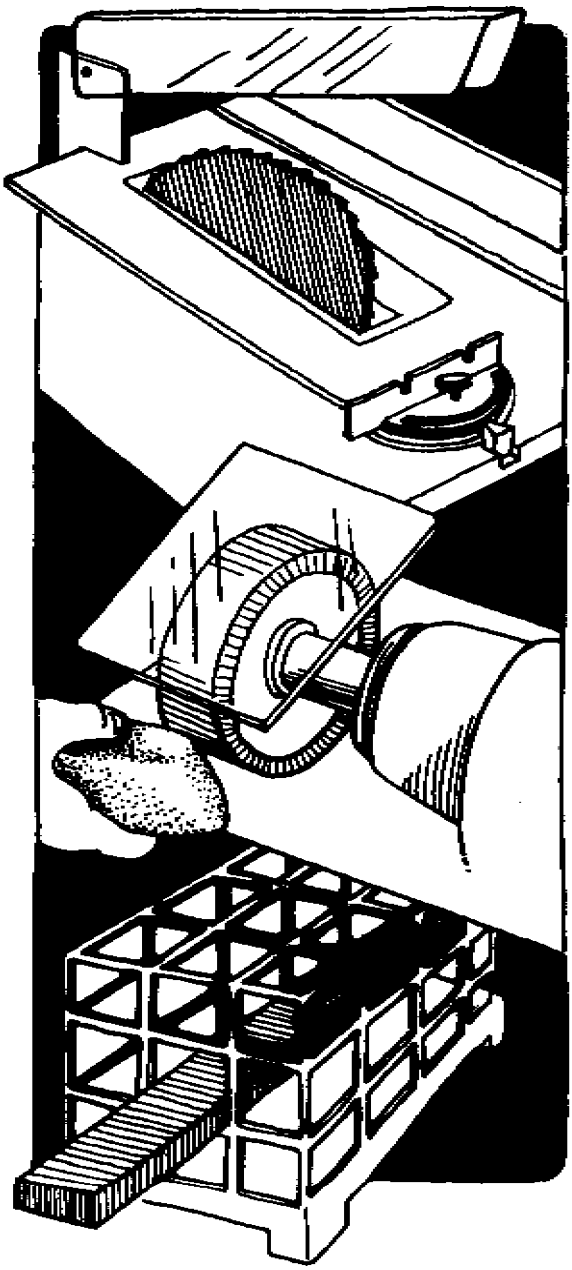
- ✓ Follow all instructions of machinery and tool use.
- ✓ If you're unfamiliar with a machine, insist on proper training before using it.
- ✓ Don't wear gloves, loose sleeves or cuffs, rings, watches or other jewelry when you work with machinery. They could get caught and pull your hand or foot into danger.
- ✓ Use a push stick—never your hands—to feed materials into moving machinery.
- ✓ Keep your hands away from moving machine parts or pinch points.
- ✓ When stacking materials, keep your fingers on the sides, not the bottom, of the stack.
- ✓ Before any repair work is done on a machine, make sure an authorized person "locks it out" and disconnects the power. Power should only be restored after proper restart procedures are followed.

WATCH FOR HAZARDS

Any moving part has the potential to injure you. Look around for hazards and make it your job to avoid them.

Machine Guards Protect You and Your Coworkers

Safety guards protect you and your coworkers from numerous dangers, including moving or sharp machine parts, flying sparks or particles and hot surfaces. Conscientious operation and maintenance of machine guards will keep them working as your front-line defense against serious injury.



PROTECT YOUR HANDS AND ARMS

Guards help protect your arms, hands and fingers, which are especially vulnerable to injury, from a variety of machinery parts. The machine you use should have guards if there's any way your hands could come in contact with the point of operation or any moving parts. Guards should prevent your hands and fingers from entering the machinery from any angle, and the guard itself should not have any sharp surfaces or pinch points.

SAFE AND PRODUCTIVE

Sometimes it may seem as if a machine guard interferes with your productivity. This is no excuse to remove or modify a guard. Although some conditions may make the machine guard seem like a burden, don't compromise your safety by removing guards.

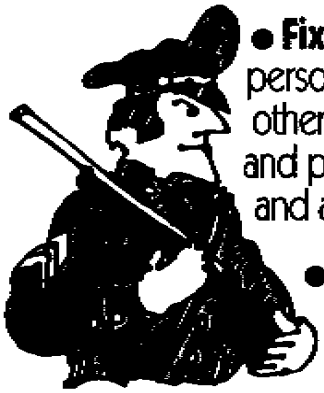
Talk with your supervisor if you're worried about meeting production goals, or if you believe the guard should be changed to make it both safe and productive. Guards are designed to protect you. Let them do their job and they'll help you do yours more safely.

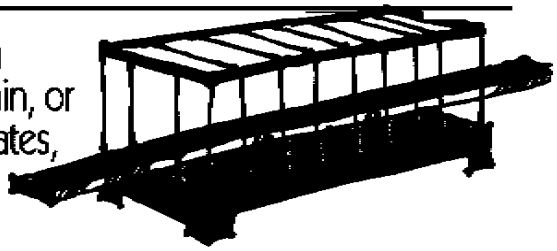
YOUR ROLE IN SAFETY

You play an important part in ensuring that guards do the job for which they were designed. When operating machines, follow these rules:

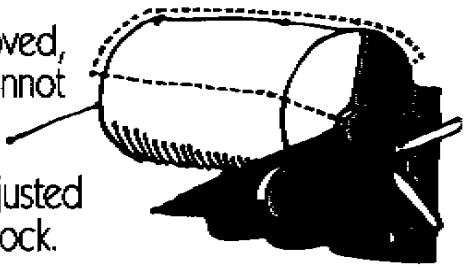
- ✓ **Never remove or bypass a guard or other safety device.**
- ✓ **Never operate a machine if a guard is missing, modified or not working correctly.**
- ✓ **If a guard must be removed for maintenance, make sure it's replaced and working properly before operations resume.**

Machine Guards Ward Off Danger



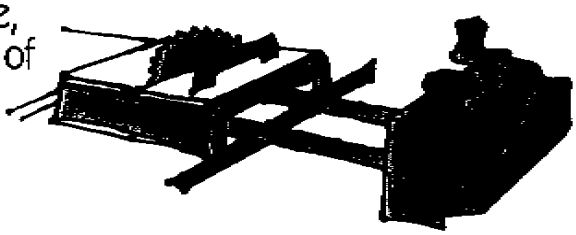


- **Fixed guards** provide a barrier between a person and the point of operation, power train, or other moving parts. These include fences, gates, and protective covers for blades, presses, and all moving parts.



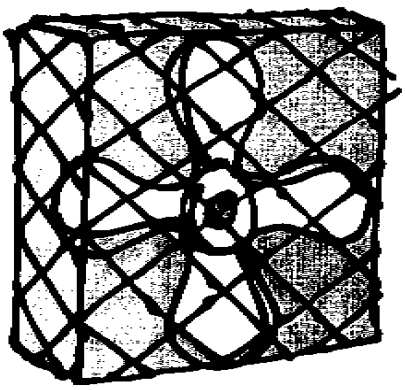
- **Interlocked guards,** when opened or removed, disengage the machine's power source. It cannot be restarted until the guard is replaced.

- **Adjustable guards** provide a barrier that can be adjusted to many different operations, such as varying sizes of stock.

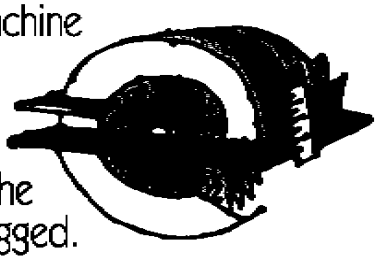


- **Self-adjusting guards** are barriers that move, or self-adjust, according to the size or position of the workplace. The guard returns to its resting position when no material is passing through.

Guards only work if you use them!



Never remove a guard or use a machine if the guard is not in position. When guards are removed for repair or adjustment, power should be turned off and the main power switch locked and tagged.



Remember:

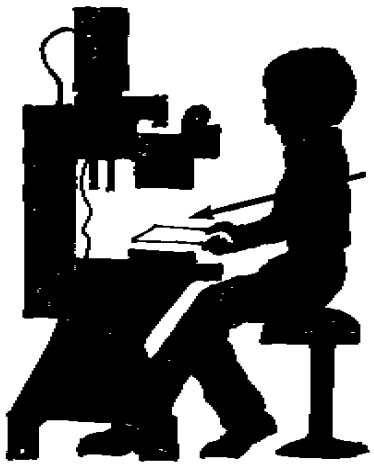
- Never reach around or under a guard. You are defeating the guard's purpose!

- Revolving drums, barrels, containers, and fan blades also require guards to prevent accidental contact. Be sure to use the appropriate guard for each piece of machinery.

- If a guard is missing or damaged, report it to your supervisor. Don't operate the machinery without it!

Hands Off Machine Guards!

(They're there to protect your hands.)



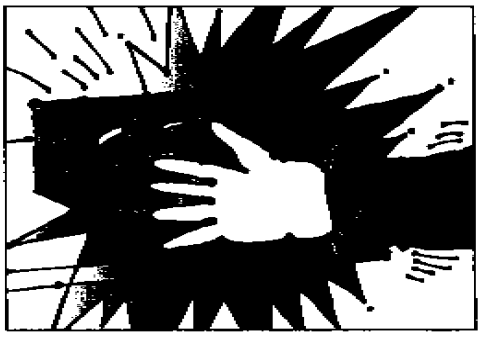
OSHA requires guards and other safety devices to save your hands from serious injury. It's all too easy to get a finger or hand caught in the moving parts of a machine at its:

- **Point of operation** (where the work actually takes place), or
- **Power train** (where energy is transferred).

Cuts, bruises, broken bones, or even amputation could result!

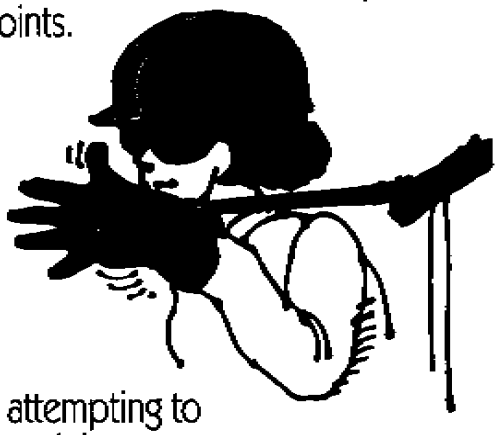
Required safety devices on machines include:

- **Machine guards**—these are fixed barriers and interlocking or adjustable guards that keep you from reaching into a hazardous area.
- **Presence-sensing devices**—these shut a machine down if they sense your hand is too close.



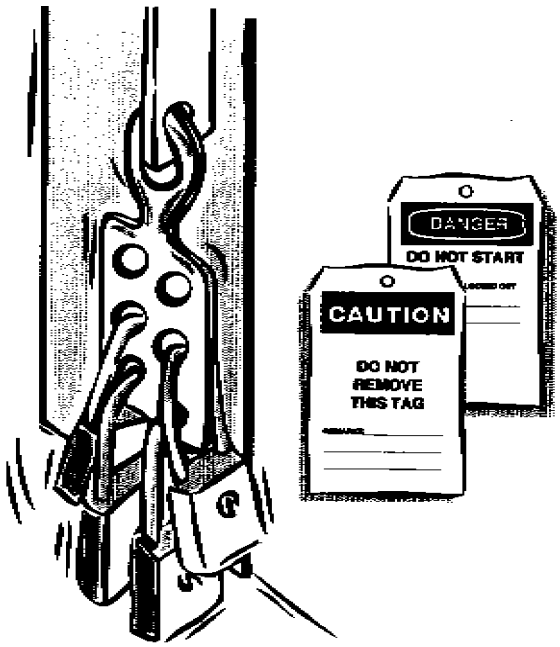
- **Restraints and pullback devices**—these force your hands away from hazard points.

To help save your hands from serious injury, remember:



- Never remove or disable a machine guard!
- Never reach around a machine guard!
- Always follow proper lockout/tagout procedures before attempting to unjam or repair a machine at its point of operation or power train!

Controlling Hazardous Energy



HOW LOCKOUT AND TAGOUT PROTECT YOU

Lockout and tagout rules are designed to protect workers from unexpected startup or release of stored energy that could cause injury. Although only authorized employees are permitted to perform lockout procedures and to remove locks and tags, all employees need to understand lockout and tagout procedures.

KEEPING ENERGY "OFF"

Lockout means putting a lock on a machine or a piece of equipment to make sure it stays off. Lockout locks must meet special requirements and must be identified by the name of the worker who installs and removes them. When equipment can't be locked out, it must be "tagged out" with a special tag that warns other workers of the danger of starting up the machine. These tags must also meet special requirements and identify the authorized employee.

RESTARTING EQUIPMENT

After the work is completed, only the same authorized employee who installed the lock may remove it and restart the equipment. He or she will make sure all other workers are a safe distance away, remove tools from the equipment, reinstall machine guards, restore energy and notify others that the machines are working and back on.

Eight Steps to Lock Out Hazards

1. **THINK, PLAN AND CHECK.** If you're in charge, think through the entire procedure. Identify all parts of any systems that need to be shut down. Find the switches, valves or other devices that need to be locked out.
2. **COMMUNICATE.** Tell affected employees you'll be locking out the equipment and why.
3. **LOCATE ALL POWER SOURCES,** including stored energy in springs or hydraulic systems.
4. **NEUTRALIZE ALL POWER AT ITS SOURCE.** Disconnect electricity. Block movable parts. Release or block spring energy. Drain or bleed hydraulic and pneumatic lines. Lower suspended parts to rest positions.
5. **LOCK OUT ALL POWER SOURCES.** Use a lock designed only for this purpose. Each worker should have a personal lock.
6. **TEST OPERATING CONTROLS.** Turn on all controls to make sure the power doesn't go on.
7. **TURN CONTROLS BACK TO "OFF."**
8. **PERFORM NECESSARY REPAIRS OR MAINTENANCE.**

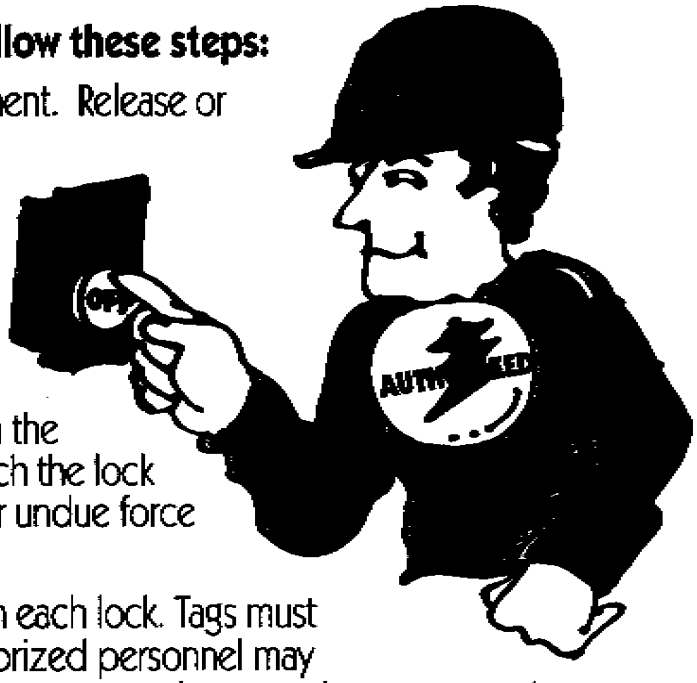
Lockout/Tagout for Safety

Before working on electrical equipment, electrical safety requires an authorized person. He or she will disconnect the source of power and lock it out and tag it to prevent accidental release of energy.

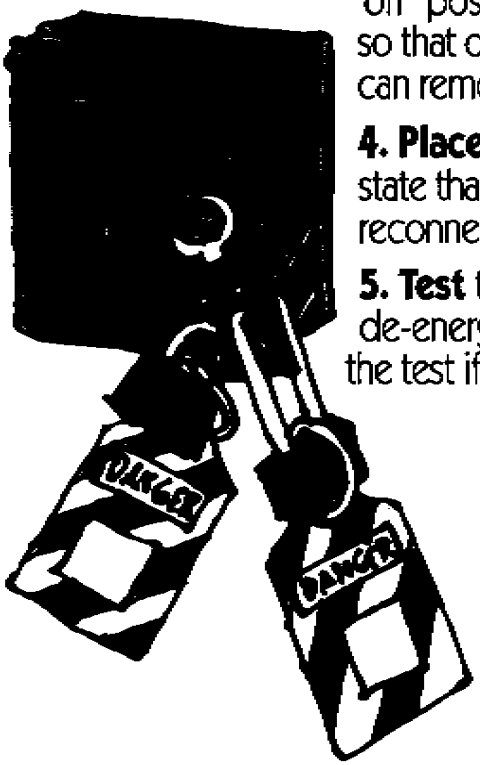
Authorized workers only will follow these steps:

1. Turn off the machine or equipment. Release or block any stored energy.

2. Disconnect the equipment and circuits from the electric power source.



3. Lock out the electric energy sources and operating controls with a lock that holds the control in the "off" position. Attach the lock so that only tools or undue force can remove it.



4. Place a tag with each lock. Tags must state that only authorized personnel may reconnect the power, operate the controls, or remove the tag.

5. Test to make sure that the circuit and equipment are really de-energized. Check the test equipment itself before and after the test if the circuit is more than 600 volts.

After the Work Is Over

Once the work on or around the electrical equipment or circuit is completed, the Qualified person follows these steps:

1. **Make** sure all tools and equipment have been removed from the area.
2. **Warn** workers to stay away from the circuit or equipment.
3. **Remove,** or supervise the removal of, the lock and tag.

Exceptions to the Rule

1. **A tag can be used without a lock if** the employer demonstrates that the tag is equally as safe as a lock, and uses at least one other protective measure, such as blocking a control switch.

2. **A lock can be used without a tag if** only one circuit or piece of equipment is involved and the lockout period applies to only one work shift , and employees responsible for re-energizing know the procedures.